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ETHNOBOTANIC STUDY OF MEDICINAL PLANTS IN EAST PENFUI VILLAGE, KUPANG REGENCY

Studi Etnobotani Tentang Tanaman Obat di Desa Penfui Timur, Kabupaten Kupang

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ABSTRACT

Indonesia is recognized as one of the world's five megadiverse countries, possessing exceptionally high levels of biological diversity. This rich biodiversity makes Indonesia an important source for the development of traditional medicine. Identification of medicinal plants in Southeast Asia indicates that approximately 80% of medicinal plant species are found in Indonesia. Overall, Indonesia possesses 5,490 medicinal plant taxa, which account for about 20% of the world's total medicinal plant species. This vast biological wealth reinforces Indonesia's status as a megadiverse nation and highlights the importance of documenting traditional medicinal knowledge among local communities. As a megadiverse country, Indonesia makes significant contributions to traditional healing practices across various regions, including the East Nusa Tenggara (NTT) Province. This study aims to document the traditional knowledge of the people of Penfui Timur Village, Kupang Regency, regarding the use of local medicinal plants. The research specifically focuses on therapeutic (medicinal) uses of plants, excluding their spiritual or cultural applications. An ethnobotanical survey was conducted through observation, interviews, and visual documentation from May to June 2025. The results identified 26 medicinal plant species from 22 families used by the community to treat various ailments such as diarrhea, fever, wounds, bone fractures, white tongue, postpartum recovery, and gout. Leaves were the most commonly used plant part due to their easy accessibility and abundance of bioactive compounds. This local knowledge reflects the traditional wisdom of sustainable biological resource utilization and underscores its importance as a foundation for biodiversity conservation and the development of traditional medicine.

Keywords: Medicinal Plants; Plant Organs; Traditional Medicine Benefits

ABSTRAK

Indonesia merupakan salah satu dari lima negara dengan tingkat keanekaragaman hayati tertinggi di dunia (megadiverse countries). Kekayaan hayati ini menjadikan Indonesia sebagai sumber penting dalam pengembangan pengobatan tradisional. Hasil identifikasi tanaman obat di kawasan Asia Tenggara menunjukkan bahwa sekitar 80% spesies tanaman obat terdapat di Indonesia. Secara keseluruhan, Indonesia memiliki 5.490 taksa tumbuhan obat yang mencakup sekitar 20% dari total spesies tanaman obat di dunia. Keanekaragaman hayati tersebut menegaskan status Indonesia sebagai negara megadiversitas sekaligus menyoroti pentingnya pendokumentasian pengetahuan pengobatan tradisional masyarakat. Sebagai negara megadiversitas, Indonesia memberikan kontribusi besar terhadap praktik pengobatan tradisional di berbagai wilayah, termasuk di Provinsi Nusa Tenggara Timur (NTT). Penelitian ini bertujuan untuk mendokumentasikan pengetahuan tradisional masyarakat Desa Penfui Timur, Kabupaten Kupang, mengenai pemanfaatan tanaman obat lokal. Penelitian ini secara khusus berfokus pada penggunaan tanaman untuk tujuan pengobatan (terapeutik) dan tidak mencakup penggunaan spiritual maupun budaya. Metode yang digunakan adalah survei etnobotani melalui observasi, wawancara, dan dokumentasi visual, yang dilaksanakan pada Mei – Juni 2025. Hasil penelitian menunjukkan bahwa terdapat 26 spesies tanaman obat dari 22 famili yang dimanfaatkan masyarakat untuk mengobati berbagai penyakit seperti diare, demam, luka, patah tulang, lidah putih, pemulihan pasca persalinan, dan asam urat. Bagian tumbuhan yang paling sering digunakan adalah daun, karena mudah diperoleh dan mengandung berbagai senyawa bioaktif. Pengetahuan lokal ini mencerminkan kearifan tradisional dalam pemanfaatan sumber daya hayati secara berkelanjutan serta penting untuk dilestarikan sebagai dasar pengembangan dan konservasi keanekaragaman hayati.

Kata kunci: Khasiat Obat Tradisional; Organ Tanaman; Tanaman Obat

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A. INTRODUCTION

Indonesia is one of the five countries with the highest levels of biodiversity in the world (megadiverse countries) (Ministry of Health of the Republic of Indonesia 2020). This biological richness makes Indonesia an important source for the development of traditional medicine. Identification of medicinal plants in Southeast Asia indicates that approximately 80% of medicinal plant species are found in Indonesia (Cahyaningsih *et al.* 2021). Overall, Indonesia possesses 5,490 taxa of medicinal plants, representing about 20% of the world's total medicinal plant species (Cahyaningsih *et al.* 2021). Of these, 5,408 species have been identified, encompassing 245 families and 1,809 genera (Cahyaningsih *et al.* 2021). In recent years, increasing interest in natural-based products has further stimulated research and the discovery of new plant-derived medicines (Hertiani *et al.* 2019). However, despite this substantial potential, systematically documented scientific information on the use of medicinal plant species by local communities particularly regarding the plant parts used and their traditional therapeutic applications remains limited, highlighting the need for the present study to address this knowledge gap.

This biodiversity contributes significantly to traditional medicinal practices in various regions, including East Nusa Tenggara (NTT). One community that continues to maintain traditional medicinal practices is the people of East Penfui Village, Central Kupang District, Kupang Regency. East Penfui Village was selected as the study site because its community remains actively engaged in the use of locally available medicinal plants passed down through generations, despite increasing access to modern healthcare services. Compared to other villages in Kupang Regency, East Penfui Village demonstrates a stronger preservation of traditional knowledge related to the use of medicinal plants. Traditional medicine in this community involves the use of various plant parts, such as leaves, stems, stem larvae, bark, latex, and fruits.

Ethnobotanical research plays a strategic role in documenting local knowledge regarding the use of plants as traditional medicines and uncovering their scientific potential. Scientific documentation of these medicinal plant uses serves as a crucial basis for biodiversity conservation efforts and provides a valuable source of information for herbal product development. However, systematically documented ethnobotanical information regarding medicinal plant species, the plant parts utilized, and their therapeutic uses among the community of East Penfui Village, Central Kupang District, Kupang Regency, remains very limited. This reflects a clear research gap, as ethnobotanical studies in Indonesia have largely focused on Java, Sumatra, and Kalimantan, while the Nusa Tenggara Timur (NTT) region has received comparatively less attention despite its rich biodiversity and unique traditional medicinal practices. Therefore, this study specifically aims to identify and document the medicinal plant species used by the community of East Penfui Village, including the plant parts utilized and their traditional therapeutic applications, as an effort to preserve local knowledge and to provide baseline scientific data for future research.

B. METHODS

This study involved 10 respondents selected using purposive sampling. Respondents were native residents of Penfui Timur Village who had long resided in the area and had direct knowledge and experience in the use of traditional medicinal plants. The respondents were predominantly adult mothers who play an active role in family health management and the use of traditional medicine at the household level. The respondent selection criteria included: (1) being from the local community of Penfui Timur Village, (2) having knowledge of the use of medicinal plants, (3) having practiced or currently practicing traditional medicine, and (4) being willing to provide information voluntarily. This group was selected based on the central role of adult women in transmitting traditional medicinal knowledge within the family and local community.

The research method used was a survey, which was applied to determine the research location and identify the types of medicinal plants in Penfui Timur Village, Kupang Tengah District, Kupang Regency. The geographical location of the study area is presented in Figure 1. The observation locations were determined and documented using geographic coordinates. Data collection techniques included observation, interviews, and documentation. Observations were conducted by observing the community's yards and gardens, while interviews were conducted with local residents regarding the medicinal plants they use, including local names, uses, plant parts used, and how they are used. Documentation was conducted by taking photographs of the medicinal plants used by the community. The data obtained were analyzed descriptively and qualitatively with reference to the Book of Medicinal Plants (Herbie 2015), which is presented in tables and figures.

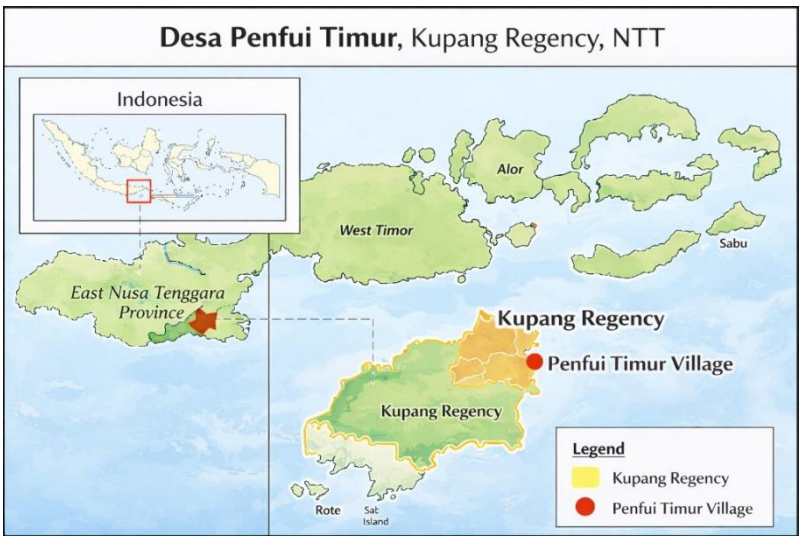
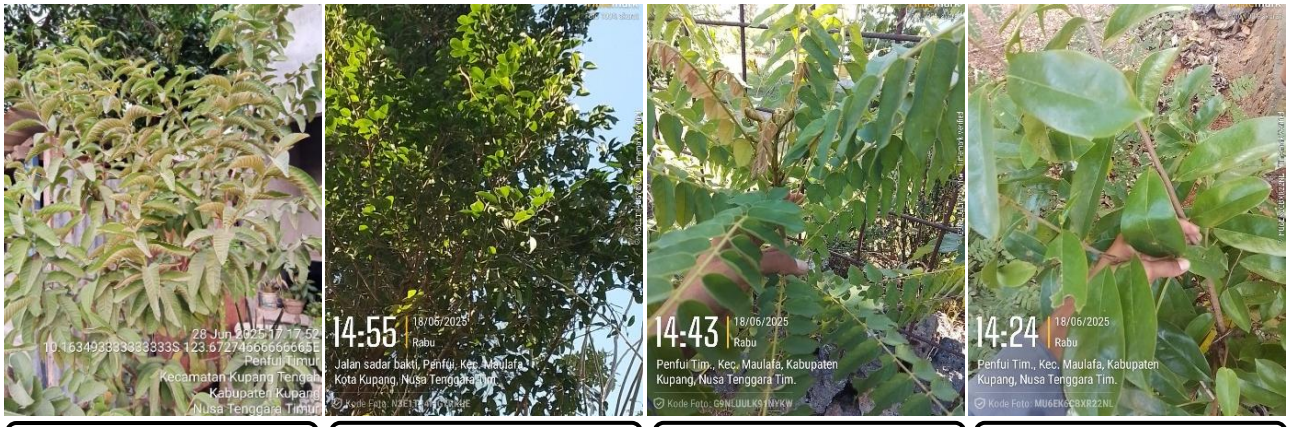


Figure 1. Location of medicinal plant observation in Penfui Timur Village, Kupang Tengah District, Kupang Regency

C. RESULTS AND DISCUSSION

In general, the lives of the people of East Penfui Village are dominated by agriculture and animal husbandry as their primary livelihoods. Located in the Kupang Tengah District, Kupang Regency, the village has a geographical setting consisting of dry plains and hills. The seasonal patterns in East Penfui Village are similar to those in other areas of East Nusa Tenggara, with two main seasons: the rainy season and the dry season, which tends to be long and dry. The people of East Penfui Village grow traditional medicinal plants in their yards and backyards. Research has identified 26 types of medicinal plants, including leaves, sap, fruit, bark, seeds, and caterpillars, commonly used by the people of East Penfui Village (Figure 2 and Table 1).



Psidium guajava | *Ficus benjamina* | *Averrhoa bilimbi* | *Annona muricata*

Moringa oleifera | *Ceiba pentandra* | *Morinda citrifolia* | *Alstonia scholaris*

Figure 2. Traditional medicinal plants used by the people of Penfui Timur village

Research on medicinal plants in Penfui Timur Village, Kupang Regency, reveals that the plants used by the community are categorised into nine groups based on their therapeutic properties for various diseases. One of the main categories is digestive ailments. To treat diarrhoea, local people usually use guava leaves (*Psidium guajava*) from the Myrtaceae family and red binahong plants (*Anredera cordifolia*) from the Basellaceae family. The processing method is quite simple: boil 5–7 leaves and then drink the boiled water. Scientifically, guava leaf extract is known to inhibit the growth of Escherichia coli and Shigella flexneri, two bacteria that cause diarrhoea, and contains the compound quercetin, which has a spasmolytic effect on intestinal smooth muscle (Hirudkar *et al.* 2020). Other research also suggests that boiling guava leaves can reduce the frequency of diarrhoea in children (Hasviana *et al.* 2022). Furthermore, binahong leaf extract has been shown to increase IL-6 and VEGF levels, which play a crucial role in tissue regeneration in burns and wounds infected with Pseudomonas aeruginosa (Sukrama *et al.* 2017). Other plants used for digestive disorders include the Sugar

Apple (*Annona squamosa*) from the Annonaceae family and the Horsetail (*Synedrella nodiflora*) from the Asteraceae family. Both plants are used to treat bloating and stomach aches. Sugar apple leaves are usually crushed and applied topically to the stomach to relieve discomfort caused by excess gas. Research supports this use, stating that a decoction or extract of *A. squamosa* leaves has anti-inflammatory and analgesic activity that can help reduce gastrointestinal discomfort (Mali *et al.* 2017).

Table 1. Types of medicinal trees and plants found in Penfui Timur village, Kupang Regency

Disease Category / Local Name	Species Name	Scientific Name	Organ	Benefit
Digestive Diseases				
Pohon kirabas	Jambu biji	*Psidium guajava*	Leaves	diarrhea
Pohon belimbi	Pohon belimbing wuluh	*Averrhoa bilimbi*	Fruit	cholesterol, gout, and mouth ulcers
Pohon nona	Pohon srikaya	*Annona squamosa*	Leaves	flatulence medication
Tanaman ronta kuda	Tanaman jotang kuda	*Synedrella nodiflora*	Leaves	stomach aches
Tanaman kumis kucing	Tanaman kumis kucing	*Orthosiphon aristatus*	Leaves	bloody stools
Tanaman binohong merah	Tanaman binahong merah	*Anredera cordifolia*	Leaves	diarrhea
Tanaman akar kucing/ anting-anting	Tanaman kucing galak	*Acalypha indica*	Leaves	*gerd*
Bone, Muscle, and Joint Diseases				
Pohon nunuh	Pohon beringin	*Ficus benjamina*	Stem sap	bone fracture
Tanaman patah tulang	Tanaman patah tulang	*Euphorbia tirucalli*	Stem	bone fracture
Pohon nitas	Pohon kepuh	*Sterculia foetida*	Seed	*bruise cream*
Tanaman jahe merah	Tanaman jahe merah	*Zingiber officinale*	Tubers	low back pain
Tanaman sirih cina	Tanaman sirih cina	*Peperomia pellucida*	Leaves	low back pain
Skin Diseases and Wounds				
Pohon neke/kapok	Pohon kapuk	*Ceiba pentandra*	Leaves	boils on the skin
Pohon lete	Pohon pulai	*Alstonia scholaris*	Leaves	boils and wounds
Pohon sirsak	Pohon sirsak	*Annona muricata*	Leaves	boils on the skin
Tanaman sufmuti	Tumbuhan krinyuh	*Chromolaena odorata*	Leaves	wound
Tanaman ende	Tanaman jarak	*Coccinia grandis*	Leaves	boils on the skin
Tanaman pisang	Tanaman pisang	*Musa paradisiaca*	Stem sap	burns
Tanaman binohong merah	Tanaman binahong merah	*Anredera cordifolia*	Leaves	burns
Tanaman akar kucing/ anting-anting	Tanaman kucing galak	*Acalypha indica*	Leaves	wounds
Skin Diseases and Wounds				
Pohon marungga	Pohon kelor	*Moringa oleifera*	Leaves	treat fever
Pohon wangkudu	Pohon mengkudu	*Morinda citrifolia*	leaves, roots and bark	treat fever
Tanaman ende	Tanaman jarak	*Coccinia grandis*	Leaves	fever
Tanaman pecut kuda	Tanaman pecut kuda	*Stachytarpheta jamaicensis*	Leaves	tonsillitis and sore throat
Pohon wangkudu	Pohon mengkudu	*Morinda citrifolia*	roots and bark	malaria medication
Metabolic Diseases (Diabetes, Gout, Cholesterol, Hypertension)				
Pohon belimbi	Pohon belimbing wuluh	*Averrhoa bilimbi*	Fruit	cholesterol, gout, and mouth ulcers
Pohon ata	Pohon sirsak	*Annona muricata*	Leaves and bark	gout
Pohon wangkudu	Pohon mengkudu	*Morinda citrifolia*	Leaves	diabetes
Pohon kersen	Pohon ceri	*Muntingia calabura*	Fruit	diabetes
Tanaman sirih cina	Tanaman sirih cina	*Peperomia pellucida*	Leaves	gout and high blood pressure

Disease Category / Local Name	Species Name	Scientific Name	Organ	Benefit
Pohon marungga	Pohon kelor	*Moringa oleifera*	seeds	to lower high blood pressure
Respiratory Diseases				
Tanaman akar kucing/ anting-anting	Tanaman kucing galak	*Acalypha indica*	Leaves	cough and asthma
Oral and Dental Diseases				
Pohon belimbi	Pohon belimbing wuluh	*Averrhoa bilimbi*	Fruit	cancer sores
Tanaman patah tulang	Tanaman patah tulang	*Euphorbia tirucalli*	tree sap	toothache
Maternal and Child Health				
Pohon faloak	Pohon faloak	*Sterculia quadrifida*	tree bark	to remove dirty blood from mothers who have just given birth
Pohon gala-gala merah	Pohon turi	*Sesbania grandiflora*	Leaves	for mothers giving birth to prevent white blood cells from rising
Tanaman jahe merah	Tanaman jahe merah	*Zingiber officinale*	Tubers	to regulate menstruation
Pohon kabate	Pohon kabate		Caterpillar	white tongue babies
Other Diseases				
Tanaman kumis kucing	Tanaman kumis kucing	*Orthosiphon aristatus*	Leaves	low back pain
Pohon marungga	Pohon kelor	*Moringa oleifera*	Leaves	increase body resistance

Meanwhile, *S. nodiflora* leaves are boiled (5-7 leaves), and the resulting decoction is drunk. This plant extract has been shown to inhibit the production of prostaglandins and pro-inflammatory cytokines such as TNF-α and IL-6, as well as suppress the expression of COX-2 and iNOS enzymes in macrophages (Le *et al.* 2020). The *Acalypha indica* is traditionally used to treat symptoms of Gastroesophageal Reflux Disease (GERD). Four to six leaves are boiled, and the resulting decoction is drunk. The active ingredients in these leaves are believed to soothe the stomach and help reduce symptoms of acid reflux (Zahidin *et al.* 2017). In addition to digestive benefits, the *Averrhoa bilimbi*, a member of the Oxalidaceae family, is also used by the community. Its fruit is used to treat cholesterol, gout, and mouth ulcers. Research indicates that an infusion of starfruit flowers and fruit contains vitamin C and anti-inflammatory activity that supports the healing of oral ulcers caused by mouth ulcers (Mehta *et al.* 2023). Another frequently used plant is *Orthosiphon aristatus* from the Lamiaceae family. The leaves are boiled (4-5 leaves), and the resulting water is drunk to treat bloody stools. The phenolic compounds and caffeic acid in *O. aristatus* leaves are known to have antibacterial and antioxidant effects that aid in the recovery of gastrointestinal bleeding, such as in cases of bloody stools (Chua *et al.* 2018).

The second category is Bone, Muscle, and Joint Diseases. In this category, the people of East Penfui Village utilize various medicinal plants to aid the healing process of injuries and disorders of the musculoskeletal system. For broken bones, the community typically uses the sap of the Banyan tree (*Ficus benjamina*) from the Moraceae family and the stem of the *Euphorbia tirucalli* from the Euphorbiaceae family. To use the sap, *F. benjamina* is applied to the affected area. *E. tirucalli* stems are typically ground and applied externally to help accelerate the healing of broken bones. Research supports this use, showing that *E. tirucalli* stem extract has the ability to stimulate tissue repair, thereby accelerating bone healing (Jalindar 2021). To treat back and joint pain, people use *Zingiber officinale* tubers from the Zingiberaceae family and *Peperomia pellucida* leaves from the Piperaceae family. The *Z. officinale* tubers are boiled, and the resulting decoction is drunk. Research shows that consuming *Z. officinale* is effective in relieving back and muscle pain associated with joint inflammation and muscle fatigue, thanks to its muscle relaxant effects and increased blood circulation (Anggraeni *et al.* 2023). *P. pellucida* leaves are also used by boiling them and drinking the water to help relieve muscle and joint pain.

Category Three Skin Diseases and Wounds. In this category, several medicinal plants are traditionally used to treat various skin conditions, including boils and burns. One commonly utilized plant is the kapok tree (*Ceiba pentandra*, Bombacaceae). The leaf tips are crushed and applied directly to boils, which is believed to accelerate the healing process. Research has shown that *C. pentandra* leaf extract contains bioactive compounds such as saponins, phenols, alkaloids, and tannins, which exhibit antimicrobial activity against various pathogenic bacteria, including Staphylococcus aureus, a common cause of skin infections like boils (Osuntokun *et al.* 2017). The pulai tree (*Alstonia scholaris*, Apocynaceae) is also used to treat wounds and boils. Fresh leaves are crushed and applied directly to the injured skin. The antioxidant activity of pulai leaves, confirmed through DPPH and FRAP assays, helps accelerate healing by reducing oxidative stress in the wound area (Ali *et al.* 2015).

Another plant used is the soursop tree *Annona muricata* (Annonaceae). Crushed soursop leaves are applied to infected skin to promote the shrinkage and healing of boils. Active compounds such as acetogenins, flavonoids, and alkaloids contribute to its antimicrobial and anti-inflammatory effects (Coria-Téllez *et al.* 2016). The *Coccinia grandis* (Cucurbitaceae) is also known as a traditional remedy for various skin disorders. Young leaves are typically boiled, and the decoction is consumed, especially for children with boils or rashes.

C. grandis leaf extract has been shown to protect cells from oxidative stress and accelerate wound healing, making it effective for treating irritated skin conditions (Al-Madhagy *et al.* 2019). For burn treatment, the *Musa paradisiaca* (Musaceae) is commonly used. Stem sap is applied directly to burns. Research demonstrates that *M. paradisiaca* sap can accelerate wound healing by increasing fibroblast proliferation, collagen production, and reducing the activity of tissue-degrading enzymes such as MMP-2 and MMP-9 (Budi *et al.* 2022). The *Anredera cordifolia* (Basellaceae) is also effective for healing burns and digestive disorders such as diarrhea. Binahong leaf extract has been shown to increase IL-6 and VEGF levels, which are important in burn tissue regeneration, even in wounds infected with *Pseudomonas aeruginosa* (Sukrama *et al.* 2017). Another plant with high potential for wound healing is the *Acalypha indica* (Euphorbiaceae). Leaves are crushed and applied directly to the injured skin. Scientifically, *A. indica* leaf extract has been shown to accelerate wound healing by enhancing collagen type I and III synthesis and exhibiting strong antioxidant and anti-inflammatory activity (Ganeshkumar *et al.* 2012). The pulai tree (*Alstonia scholaris*) is also traditionally used for wound care. Fresh leaves are crushed and applied to the wound. Finally, the *Chromolaena odorata* (Asteraceae) is widely used for open wounds and burns. Leaves are crushed and applied directly to the injured area.

Category Four Fever and Infection. Several medicinal plants have been traditionally used to treat fever and infections. One of these is the Moringa tree (*Moringa oleifera*, Moringaceae). Moringa leaves are traditionally used as a fever-reducing remedy. Scientifically, Moringa leaves possess anti-inflammatory and antioxidant activities that help reduce systemic inflammation and support the body's recovery process (Gaikwad *et al.* 2011). In addition, the *Morinda citrifolia* (Rubiaceae) is widely used to manage fever. Various parts of the plant including leaves, roots, and bark are utilized, with leaves often boiled and consumed as a decoction.

Another effective plant is the *Coccinia grandis* (Cucurbitaceae). Its leaves are traditionally used to treat fever, red spots in infants, chickenpox, and boils. Typically, young leaves are boiled, and the decoction is consumed, especially by children experiencing these symptoms. Studies have demonstrated that *C. grandis* leaves exhibit strong antipyretic, anti-inflammatory, antimicrobial, and antioxidant activities due to the presence of active compounds such as flavonoids, terpenoids, and phenols (Tamilselvan *et al.* 2011). Furthermore, the *Stachytarpheta jamaicensis* (Verbenaceae) is traditionally used to treat tonsillitis and sore throat. The leaves are usually boiled or brewed with hot water, and the decoction is consumed regularly. Liew & Yong (2016) stated that regular consumption of a decoction of Stachytarpheta jamaicensis leaves can relieve inflammation of the respiratory tract.

Category Five Metabolic Diseases (Diabetes, Gout, Cholesterol, and Hypertension). Several medicinal plants have long been traditionally used to manage metabolic disorders such as diabetes, gout, high cholesterol, and hypertension. One of these is the *Averrhoa bilimbi* (Oxalidaceae). Bilimbi fruits are traditionally used to reduce cholesterol and uric acid levels, as well as to treat mouth ulcers. Research has shown that flavonoids in *A. bilimbi* leaf extract can inhibit xanthine oxidase, an enzyme involved in uric acid formation. This activity has been proven effective in lowering uric acid levels in white mice (Fauziah *et al.* 2021).

The *Annona muricata* (Annonaceae) is also used to manage gout. Leaves and bark (approximately 3–5 leaves) are boiled, and the decoction is consumed regularly. Another useful plant is *Peperomia pellucida* (Piperaceae). Its leaves are traditionally boiled, and the decoction is consumed to treat gout and hypertension. The therapeutic effects of *P. pellucida* are supported by its ability to inhibit enzymes involved in purine metabolism and blood pressure regulation, helping to lower uric acid and high blood pressure (Ahmad *et al.* 2022). Additionally, the *Moringa oleifera* (Moringaceae) is known for its antihypertensive properties.

Category Six Respiratory Diseases. The *Acalypha indica* (Euphorbiaceae) is traditionally used for treating coughs and asthma. The leaves are boiled, and the decoction is consumed to relieve symptoms. Research has shown that *A. indica* leaf extract can inhibit airway contraction induced by acetylcholine and histamine, as well as stabilize mast cells involved in allergic and asthmatic responses (Ninave & Patil 2022).

Category Seven Oral and Dental Diseases. The *Averrhoa bilimbi* (Oxalidaceae) is traditionally used to treat mouth ulcers. Infusions of the flowers and fruits are consumed due to their high vitamin C content and anti-inflammatory activity, which support the healing of oral lesions (Mehta *et al.* 2023). The *Euphorbia tirucalli* (Euphorbiaceae) is used to relieve toothache. Latex from the stem is applied directly to the affected tooth as a pain reliever. Studies indicate that *E. tirucalli* latex possesses analgesic and anti-inflammatory properties, making it effective as a topical remedy for pain, including toothaches and neuralgia (Mali & Panchal 2017).

Category Eight Maternal and Child Health. The *Sterculia quadrifida* (Sterculiaceae) is traditionally used to "cleanse impure blood" in postpartum women. The bark is boiled, and the decoction is consumed. Research indicates that the bark contains high levels of flavonoids, phenols, and tannins, and exhibits strong antioxidant activity, which may help support

detoxification and the body's regeneration after childbirth (Siswadi *et al.* 2023). The *Sesbania grandiflora* (Fabaceae) is used for postpartum care to prevent an increase in white blood cells. The leaves are crushed and applied to the mother's head, traditionally believed to regulate white blood cell levels. Scientifically, sesbania leaves contain bioactive compounds such as flavonoids, saponins, alkaloids, and tannins, which have anti-inflammatory, antioxidant, and immunomodulatory properties (Dange *et al.* 2022). *Z. officinale* (Zingiberaceae) is utilized to facilitate menstruation. The rhizomes are boiled, and the decoction is consumed. Studies have shown that consuming *Z. officinale* can reduce the intensity of menstrual pain in adolescent girls (Juwita *et al.* 2022). In East Nusa Tenggara (NTT), the kabate tree is known not only for its timber but also for the health benefits of wood-boring larvae living inside its trunk. Traditionally, these larvae are used to treat white tongue in infants. The larvae are first fried and then consumed as a medicine.

Category Nine Other Diseases. The *O. aristatus* (Lamiaceae) is traditionally used to relieve lower back pain. The *Moringa oleifera* (Moringaceae) is used to boost immunity. The leaves are boiled and consumed, and flavonoids such as quercetin and kaempferol act as immunomodulators, enhancing both humoral and cellular immune responses (Poluan *et al.* 2023). The *Morinda citrifolia* (Rubiaceae) is traditionally used to treat malaria. The use of various plant organs as traditional medicinal materials reflects the richness of local knowledge in the utilization of medicinal plants. The community of East Penfui Village utilizes different plant parts, including stem sap, fruits, bark, stem-dwelling larvae, seeds, tubers, stems, and leaves (Table 1).

Based on 26 traditional medicinal plant species belonging to 22 families (Figure 3), the plant parts most frequently to least frequently used in traditional medicine are leaves, bark, stem sap, seeds, fruits, tubers, stems, and larvae (Figure 4). The predominant use of leaves is likely due to their ease of collection, the presence of diverse bioactive compounds, and the fact that their harvesting does not threaten plant survival. This finding is consistent with previous studies reporting that leaves are the most commonly used plant parts in traditional medicine because of their accessibility and therapeutic effectiveness (Alkawi *et al.* 2021).

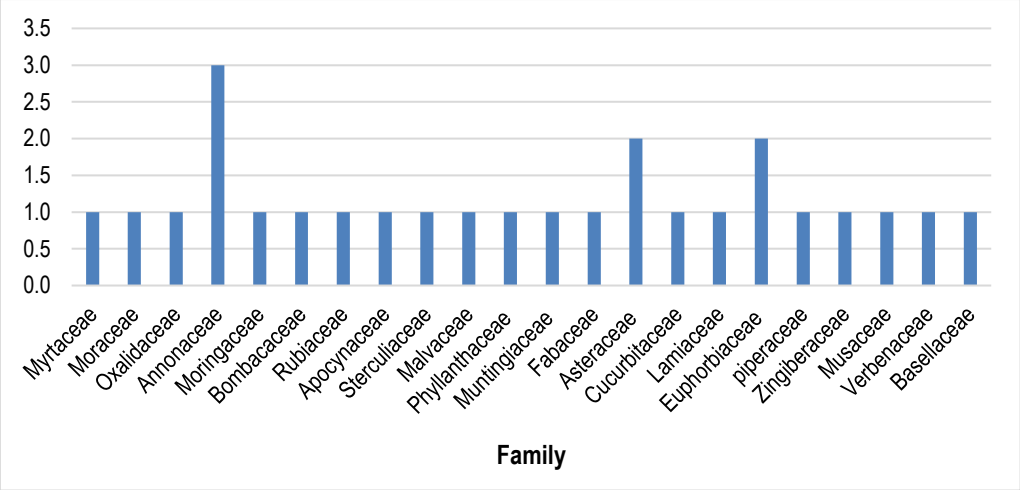


Figure 3. Types of tree families and traditional medicinal plants used by the people of East Penfui Village

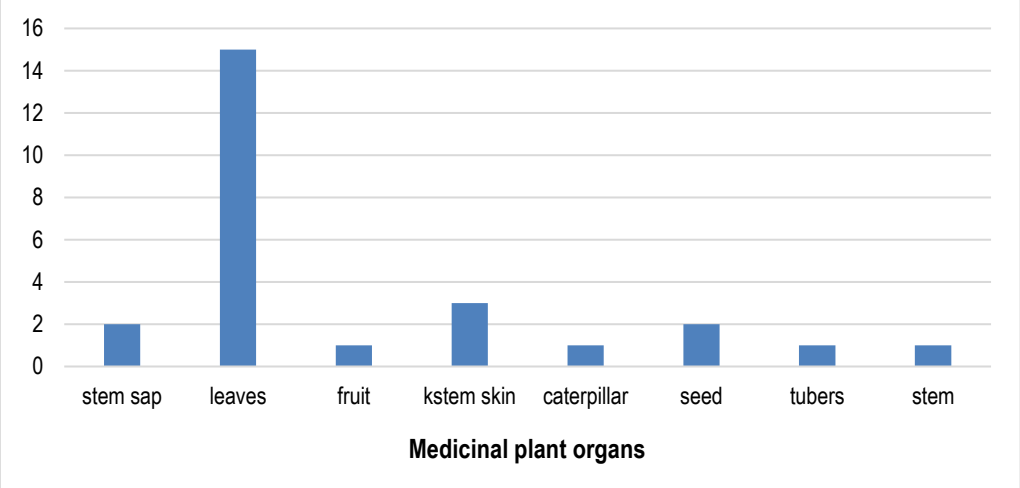


Figure 4. Tree organs and traditional medicinal plants used by the people of East Penfui Village

D. CONCLUSION

This study documented 26 traditional medicinal plant species belonging to 22 families used by the community of East Penfui Village, Kupang Regency, East Nusa Tenggara. Leaves were the most frequently utilized plant organ, followed by bark, roots, fruits, stem latex, seeds, tubers, stems, and larvae, due to their ease of collection and processing. These plants were primarily used to treat dominant disease categories, including digestive disorders, skin diseases, and common ailments such as fever and pain, reflecting the main healthcare needs of the local community. The findings indicate that traditional medicinal knowledge remains preserved and is transmitted across generations, particularly through family-based healing practices, although it is increasingly vulnerable to erosion due to modernization and lifestyle changes.

Practically, these findings have important implications for the development of herbal medicine and phytomedicine based on local knowledge, as well as for biodiversity conservation, given that most medicinal plants are sourced from the surrounding environment and require sustainable management. Nevertheless, this study has several limitations, including potential sampling bias and the absence of phytochemical validation and pharmacological testing of the recorded species. Therefore, future research is recommended to conduct comprehensive phytochemical and pharmacological studies and to expand ethnobotanical documentation across East Nusa Tenggara in order to support the long-term preservation of traditional knowledge and the sustainable use of local genetic resources.

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AUTHOR'S DECLARATION

- Conflicts of Interest: None.
- We hereby confirm that all the Figures and Tables in the manuscript are ours.
- No animal studies are present in the manuscript.
- No human studies are present in the manuscript.
- No potentially identified images or data are present in the manuscript.

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